

Appendix A

WORK PROCESS SCHEDULE TRANSIT ELEVATOR-ESCALATOR MAINTENANCE TECHNICIAN (Existing Title: Elevator Repairer) O*NET-SOC CODE: 47-4021.00 RAPIDS CODE: 0174R

This schedule is attached to and a part of these Standards for the above identified occupation.

1. TERM OF APPRENTICESHIP

The term of the apprenticeship shall be 48 months with an OJL attainment of 6399 hours. (This example assumes a certain level of competency in math and reading. Math and reading classes will be added by transit agencies that are not able to find candidates with these qualifications within their labor market.)

2. RATIO OF APPRENTICES TO JOURNEYWORKERS

Ratio as covered in the local collective bargaining agreement (CBA).

3. APPRENTICE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages based on a percentage of the current journeyworker wage rate per the CBA.

Transit Elevator-Escalator Maintenance Technician Apprenticeship Term:

By Percentage of Journey-level Wage: SAMPLE for a 36 month program and an hourly wage rate of \$28.75.

(The hourly rate is a composite representative of the current state of the industry.

Local rates will be determined by the CBA.)

Time Period | Percentage of Journey-level | Apprentice

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| 1 st six months | = 60% | = \$ 17.25 |
| 2 nd six months | = 67% | = \$ 19.26 |
| 3 rd six months | = 74% | = \$ 21.28 |
| 4 th six months | = 81% | = \$ 23.29 |
| 5 th six months | = 88% | = \$ 25.30 |
| 6 th six months | = 95% | = \$ 27.31 |

4. SCHEDULE OF WORK EXPERIENCE (See attached Work Process Schedule)

The NJATC may modify the work processes to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

5. SCHEDULE OF RELATED INSTRUCTION (All classes include practical application, diagnostics and troubleshooting where applicable)

Transit orientation
Electrical and electronics

Preventive maintenance and inspection
(See attached Related Instruction Outline for more details)

**WORK PROCESS SCHEDULE SYLLABI
TRANSIT ELEVATOR-ESCALATOR MAINTENANCE TECHNICIAN
(Existing Title: Elevator Repairer)
O*NET-SOC CODE: 47-4021.00 RAPIDS CODE: 0174R**

| 100 Level Courses | | |
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| 100 | Property Specific Orientation (including track safety, flagging, emergency evacuation) | This course is designed to familiarize the elevator/escalator technicians with each specific transit agency's procedures regarding track safety, flagging, and emergency evacuation. |
| 101 | Orientation and Background | This course is to instruct elevator/escalator technicians with the policies, procedures, and regulations that are applicable to public transit workplaces. The course will be customized for local operation procedures, policies and each transit needs/requirements. |
| 102 | Electrical and Job Safety | This course is designed to familiarize the technician with basic concepts of electricity and safety when working on or near electricity and moving equipment. The course can also be a refresher for those who have had previous technical training or related work experience. |
| 103 | Tools and Material Handling | The purpose of this course is to familiarize the technician with the proper skills needed to operate hand and power tools and material handling equipment safely during maintenance and repair of modern transit elevator-escalator equipment. Construction, design and operation of tools are included in the lessons. Upon completion of the course the technician should be able to list and demonstrate safe operation of various measuring tools, hand tools, electric tools, pneumatic tools and material handling equipment. |
| 104 | Basic Mathematics | The purpose of this course is to review of basic mathematic and |

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| | | <p>algebraic functions. Also it is designed as a refresher course for individuals who have had formal technical/vocational training or who have relevant work experience in a technical field.</p> <p>Technician after this course should have a basic understanding of fundamental mathematics, including whole numbers, the basic operations of arithmetic, integers, decimals, percent's, fractions, and measurements.</p> |
| 105 | Introduction to Electricity | <p>The purpose of this course is to familiarize the technician with basic concepts of electricity. The course includes an introduction to electrical theory, voltage, current, & resistance. Also, the course covers electrical circuit materials, principles of electrical energy and electrical sources of power. Technicians will learn through lecture and several laboratory experiments. Upon completion of the course, the technician will have a firm grasp of fundamental electrical concepts, understand vital safety considerations, and acquire the ability to set up and perform core electrical experiments.</p> |
| 106 | Electrical Meters | <p>The purpose of this course is to instruct elevator/escalator technicians in basic meter principles and operation, voltage, current, & resistance Ohm's Law, electrical circuit materials, principles of electrical energy and electrical sources of power. Technicians will learn & have a firm grasp of fundamental electrical concepts, understand vital safety considerations, and acquire the ability to set up and perform core electrical experiments.</p> |
| 107 | Wiring Technologies and Equipment | <p>The purpose of this course is to familiarize the technician with the proper principles and practices of</p> |

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| | | wiring techniques and high-reliability soldering connections used throughout the electrical and electronic industry. It is suitable for individuals with no prior knowledge of electronics and soldering as well as the seasoned technician who may not have received the necessary knowledge and training in the criteria and practical consideration of wiring and soldering methods. |
| 108 | Direct Current (DC) Fundamentals | The purpose of this course is to instruct on basic fundamentals of DC circuits. The course includes an introduction to electrical theory, voltage, current, & resistance, Ohm's Law, electrical circuit materials, principles of electrical energy and electrical sources of power, and analysis of DC series, parallel and combination circuits. After completion of the course, the technician will have a firm grasp of fundamental electrical concepts, understand vital safety considerations, and acquire the ability to set up and perform core electrical experiments. |
| 109 | Alternate Current (AC) Fundamentals | This course provides the technician a thorough understanding of the basic concepts of AC Fundamentals. This course is designed to familiarize the technician with the proper principles and skills needed to begin working on AC electrical circuits. This course will also serve as a refresher course for individuals who have had technical training in the field of electronics or have related work experience in the electrical and electronic industry or a combination of both. |
| 110 | Basic Hydraulic and Pneumatic Theory & Applications | The purpose of this course is to provide an introduction to mechanical equipment and systems. |

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| | | This course provides an introduction to pneumatic and hydraulic theory and components. It proceeds to offer a deeper look at some practical applications of pneumatics and hydraulics and the control devices and design needed to implement various applications. The use of pneumatic and hydraulic schematics as a troubleshooting device is also emphasized. |
| 111 | Basic Mechanical Theory & Application | <p>The purpose of this course is to provide an introduction to mechanical equipment and systems. Theory and operation of equipment are covered as well as maintenance and inspection of equipment. Use of proper maintenance techniques and safety procedures is stressed throughout.</p> <p>Upon completion of the course, the trainee should understand the operation of mechanical drive systems, and should be able to perform basic maintenance, such as lubrication and alignment, on mechanical drive systems and associated equipment. This class will meet the requirements of the Transit Elevator-Escalator Maintenance Training Standards.</p> |
| 200-207 Level Courses | | |
| 200 | Overview of Vertical Transportation | The purpose of this course is to introduce the individuals in demonstrating proper safety procedures and developing a working knowledge of the functions of various escalator and elevator components, controls, and assemblies, commonly found in U.S. transit systems. |
| 201 | AC Motors, DC Motors, and Generators | This course is designed to familiarize the elevator/escalator technicians with the operating principles of both |

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| | | <p>AC and DC motors and generators, proper identification of motor types, preventive maintenance practices, wiring procedures for various types of motors, and the theory and operation of electric motor controllers. Theory of rotating machines and the effects of torque and speed, specific details relating to power loss, and efficiency of motors will be included in the course.</p> <p>Technicians will also explore the operation of a prime mover, dynamometer, induction motors (both single phase and phase), and synchronous motors and wound rotor motors.</p> |
| 202 | Troubleshooting Electrical - Electronic Systems | <p>This course presents a comprehensive overview of troubleshooting concepts and methods for electrical and electronic systems. The course is designed for elevator/escalator technicians who already have a good understanding of DC and AC fundamentals.</p> <p>Emphasis is placed on thinking systematically about determining the cause of electrical problems, and selecting and using the correct meters and tools to obtain needed information.</p> |
| 203 | Introduction to Electrical Ladder Drawings | <p>This course introduces technicians to electrical ladder drawings, the conventions of ladder logic, and the use of ladder drawings as a troubleshooting tool. Ladder drawings are a type of schematic diagram that represents the components in circuits without regard to the physical placement of the components.</p> |

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| 204 | AC Circuit Analysis | This course provides technicians with the theoretical and data knowledge necessary to understand and analyze reactive components in AC circuits. The concepts include inductance, inductive reactance, RL circuits, capacitance, RC circuits, RLC circuit analysis and series and parallel resonance. The student will learn the characteristics of inductors and capacitors, and the ways these components can work alone or in combination to affect electrical circuits. |
| 205 | Semiconductor Fundamentals | This course presents a comprehensive overview of solid state devices and systems. The course is designed for technicians who have some basic knowledge of electronics. Component and system construction, operation, installation, and service are emphasized. Various practical applications are presented throughout the course as they relate to temperature, light, speed, and pressure control. |
| 206 | Digital Fundamentals | This course is designed to familiarize the technician with the types of devices and circuits used to build computers and other digital equipment. The concepts presented in this course will serve as a foundation for work the technician will perform on digital hardware. Upon completion of this course the technician should have a thorough understanding of the basic concepts of digital circuit fundamentals. |
| 207 | Hydraulic and Pneumatic Applications | This course begins with a review of basic pneumatic and hydraulic theory and components. It proceeds to offer a deeper look at some practical applications of pneumatics and hydraulics and the control devices and design needed to |

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| | | implement various applications. Particular attention is paid to hydraulic and pneumatic applications that occur in elevators and escalators. The use of pneumatic and hydraulic schematics as a troubleshooting device is also used. |
| 208-220 Level Courses | | |
| 208 | Escalator - Principles of Operations | The purpose of this course is to familiarize the technicians in demonstrating proper safety procedures and a working knowledge of the functions of various escalator and elevator components, controls, and assemblies. |
| 209 | Escalator - Electrical Systems and Drive Units | The purpose of this course is to familiarize the technician in proper safety procedures and a working knowledge of the functions of various escalator and elevator components, controls, and assemblies. |
| 210 | Escalator - Step installation & Maintenance | The purpose of this course is to familiarize the technician in proper safety procedures and a working knowledge of the functions of various escalators when installing or working on step components, controls, and assemblies. |
| 211 | Escalator - Handrail Installation & Maintenance | The purpose of this course is to familiarize the technician in proper safety procedures and a working knowledge of the functions of various escalators when installing or working on handrail components, controls, and assemblies. |
| 212 | Escalator - Inspection & Maintenance | The purpose of this course is to provide an overview and familiarize technicians with a conceptual understanding of safety and maintenance practices for escalator inspection and maintenance. |
| 213 | Elevator - Principles of operations | The purpose of this course is to provide an overview and familiarize technicians with a general |

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| | | <p>knowledge and understanding of the safety regulations, codes, and Americans with Disabilities Act (ADA) requirements for elevator maintenance.</p> <p>Also, included in this course are the various types of elevators, major components, and basic principles of various systems operations.</p> |
| 214 | Elevator - Electrical Systems | The purpose of this course is to provide an overview and familiarize technicians with a general knowledge and understanding of the safety requirements for electrical wiring, testing of electrical systems, print reading, controls circuits and motors systems. |
| 215 | Elevator - Drive Systems Maintenance & Repairs | The purpose of this course is to familiarize technicians in the functions and maintenance of Elevator drive systems (both gear and gearless) and their major components. |
| 216 | Elevator - Principles of Door Operations & Repairs | The purpose of this course is to familiarize technicians in the function and maintenance of various elevator door configurations, systems, components and inspection and maintenance methods. |
| 217 | Elevator - Traction (Electric) | The purpose of this course is to provide an overview and familiarize technicians in the way a transit traction elevator works including its control system and components. |
| 218 | Elevator - Hydraulic | The purpose of this course is to provide an overview and familiarize technicians in the way a transit hydraulic elevator works including its control system and components. |
| 219 | Elevator - Inspection & Basic Maintenance | The purpose of this course is to provide an overview and familiarize technicians in the inspection & maintenance methods and procedures for both hydraulic and traction elevators. Covered in this course are basic inspections and |

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| | | <p>maintenance of components and systems in Machine Rooms, Hoistways, Pits, Car (including car top) and Landings.</p> <p>Also, included in this course are basic inspections, maintenance, and operational testing of major components (doors, controllers, brakes, & communications).</p> |
| 220 | Elevator - Other Systems | <p>The purpose of this course is to provide an overview and familiarize technicians in the operation and maintenance of the following unique vertical equipment:</p> <ul style="list-style-type: none"> Rack & Pinion Elevators Dumbwaiters Wheel Chair Lifts Material Lifts Inclined Elevator |
| 221 | Entrapments Procedures | Under development |
| 250 | Troubleshooting | Under development |
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| 300 Level Courses | | To be developed |
| 300 | Electrical - Electronic Systems | |
| 301 | Advanced Electrical Ladder Drawings | |
| 302 | Automated Equipment | |
| 303 | Elevator - Manufacturers | |
| 304 | Escalator - Manufacturers | |
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| 400 Level Courses | | To be developed |
| 400 | Advanced Controllers | |
| 401 | Manufacturer Specific Controllers | |
| 402 | Advanced Equipment Inspections | |
| 403 | Root Cause Failure Analysis | |
| 404 | <i>Predictive Maintenance</i> | |